--M.J. O'Mahony, in European Transactions on Telecommunications and Related Technologies, Vol. 4, No. 6, Nov.-Dec. 1993, pp. 629-640, presents and discusses the main design equations for a soliton system. A soliton transmission experiment over 3000 km of dispersion shifted fibre is also described. In the experiment, a train of soliton pulses with a FWHM duration of 35 ps is generated at a rate of 5 GHz by an InGaAsP electroabsorption modulator. A second electroabsorption modulator is used to impress 5 Gbit/s data on the pulse train. The technique of dispersion compensation in linear systems is disclosed as one of the possible alternatives to the technique of non-linear (soliton) transmission to overcome the limitation due to fibre dispersion for high bit rate operation over long distances (>1000 km).

EP 690534 discloses a semiconductor laser modulator used to simultaneously generate optical pulses and encode data, so as to output RZ soliton pulses suitable for transmission in long distance optical communications. One embodiment relates to a laser that is biased near threshold and is also directly encoded with digital data from a data source. A second embodiment relates to a laser modulator device. The laser is biased to output a CW laser beam which is then modulated by the modulator, controlled by an electrical pulse shaping circuit. A technique for adding further harmonics to the pulse shaping circuit is also disclosed, wherein a fundamental frequency sinusoidal signal is frequency doubled and the signal is combined with its second harmonic, to give a combined periodic analogue signal. A dual gate FET performs an AND operation of an input NRZ data stream and the combined periodic analogue signal, to produce a RZ-format signal corresponding to the NRZ data. The output of the FET is further amplified by an electronic amplifier before it is used to drive the modulator.

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US 5504609 discloses a remodulator for WDM optical communication systems. The remodulator includes an optoelectronic element for receiving an information bearing optical signal at a transmission wavelength and outputting a corresponding electrical signal. The remodulator further includes an optical carrier emitting element comprising a light source at a reception wavelength. It further includes an external modulator for directly imparting the information in the electrical signal on the optical carrier emitted by the light source.--

Page 5, line 7, to page 10, line 11, delete "In particular, in a first aspect, the present ... in an optical transmission line.", and insert therefor:

--In particular, in a first aspect, the present invention relates to a pulsed transmission system, comprising at least one transmission station for transmitting an optical signal at a transmission wavelength, at least one reception station, a fibre-optic line linking said at least one transmission station and said at least one reception station and at least one optical amplifier serially linked along said fibre-optic line, wherein said fibre-optic line has a positive overall chromatic dispersion at said transmission wavelength and comprises:

– a first optical conductor element, having a first chromatic dispersion at said transmission wavelength, and

– a chromatic dispersion compensating unit, having a second chromatic dispersion at said transmission wavelength, said second chromatic dispersion being of opposite sign with respect to said first chromatic dispersion,

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wherein said at least one transmission station comprises a high speed optical pulse transmitter adapted to generate a RZ optical signal at said transmission wavelength, bearing a coded information at a preset frequency, said RZ optical signal comprising optical pulses of duration T_{FWHM}, wherein:

– the ratio T_{bit}/T_{FWHM}, between the inverse T_{bit} of said preset frequency and said duration T_{FWHM} of the pulses, is higher than 200/75 and lower than 10, and

– said optical pulses are substantially free from chirp.

Preferably, said transmission station comprises at least an interfacing unit adapted to receive a first optical signal at said preset frequency bearing said coded information, said at least an interfacing unit including a receiving and converting unit adapted to receive said first information-bearing optical signal, to convert it into an electrical signal bearing said coded information, and to feed said information bearing electrical signal to said high speed optical pulse transmitter.

Preferably said high speed optical pulse transmitter comprises:

– an optical pulse modulator, adapted to modulate an optical signal with a sequence of periodic pulses having said duration T_{FWHM} and said preset frequency;

– an optical signal modulator, optically linked to said signal modulator, adapted to modulate said optical signal with said coded information; and

– a generator of a continuous optical signal at said transmission wavelength, optically linked to said pulse and signal modulators.

Said chromatic dispersion compensating unit can comprise a second optical conductor element serially linked to said first optical conductor element.

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In an embodiment, said optical signal at said transmission wavelength has, for at least one portion of its propagation path in one of said first and second optical conductor elements, an intensity of a value such as to cause self phase modulation of said second optical signal.

According to another embodiment, said optical amplifier has amplification characteristics such that said optical signal at said transmission wavelength has, in at least one portion of its propagation path in one of said first and second optical conductor elements, an intensity of a value such as to undergo self phase modulation.

In an embodiment, said first optical conductor element is a step-index optical fibre. In another embodiment, it is an optical fibre with non-zero dispersion.

Said chromatic dispersion compensation unit is preferably adapted to compensate a fraction of the chromatic dispersion of the line, such that the total chromatic dispersion of the line is between 100 and 120% of the compensated dispersion.

In a second aspect, the present invention relates to an optical pulse transmission method, comprising the steps of:

– emitting an optical signal at a transmission wavelength and at a preset frequency bearing a coded information;

– supplying the optical signal in an optical-fibre line having a chromatic dispersion;

– compensating the chromatic dispersion of the signal in the optical-fibre line with a chromatic dispersion of opposite sign, so as to achieve an overall positive dispersion for the optical signal;

wherein said step of emitting comprises:

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- generating a sequence of substantially chirp-free optical pulses at the transmission wavelength having a duration T_{FWHM}, the ratio T_{bit}/T_{FWHM}, between the inverse T_{bit} of said preset frequency and said duration T_{FWHM} of the pulses, being higher than 200/75 and lower than 10;

– modulating said sequence of optical pulses with said coded information.

Advantageously, said step of generating said sequence of pulses comprises combining a first periodic electrical signal at said preset frequency and at least one second periodic electrical signal at a second frequency which is a harmonic of said preset frequency.

In a third aspect, the present invention relates to a high-speed optical pulse transmitter, comprising:

– an optical signal modulator;

– an optical pulse modulator, optically linked to said signal modulator;

– a generator of a continuous optical signal, optically linked to said signal and pulse modulators;

– a signal modulator driver for feeding said signal modulator with an electrical signal bearing a coded information with a first frequency; and

– a pulse modulator driver comprising a circuit for generating a first periodic electrical signal at said first frequency;

wherein said pulse modulator driver further comprises:

– a circuit for generating a second periodic electrical signal at a second frequency which is a harmonic of said first frequency;

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– a first and a second amplifier for amplifying said first and second periodic electrical signal; and

– a combining element for combining said amplified first and second periodic electrical signals, and for feeding said pulse modulator with said combined signal.

Preferably, said circuit for generating said first periodic electrical signal at said first frequency is driven by a clock signal associated with said information-bearing electrical signal.

Preferably said circuit for generating said second periodic electrical signal comprises a frequency multiplier, linked to said circuit for generating said first periodic electrical signal.

Preferably said circuit for generating said first periodic electrical signal comprises an output for a synchronization signal, said synchronization signal being in a preset time relationship with said clock signal, said output being linked to said signal modulator driver.

Advantageously, said combining element is a distributed-constants circuit.

The present invention also relates to a pulsed transmission system, comprising at least one transmission station for transmitting an optical signal, one reception station, one fibre-optic line linking said transmission station and said reception station and at least one optical amplifier serially linked along said fibre-optic line, characterized in that said transmission station comprises a high speed optical pulse transmitter according to the above indicated third aspect of the invention.

Advantageously, said fibre-optic line has overall chromatic dispersion greater than zero at the wavelength of said optical signal.

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Preferably, said fibre-optic line comprises chromatic dispersion compensation means adapted to compensate a fraction of the chromatic dispersion of the line and such that the total chromatic dispersion of the line is between 100 and 120% of the compensated dispersion.

More preferably, said transmission station comprises:

– a plurality of high speed optical pulse transmitters, each comprising a respective generator of a continuous optical signal at a respective wavelength, different from that of the other units, each transmitter being able to generate an appropriate pulsed optical signal at a respective wavelength; and

– a multiplexer for combining said pulsed optical signals.

Even more preferably, said reception station comprises a wavelength demultiplexer for separating said pulsed optical signals.

In a still further aspect, the present invention relates to a method of high-speed optical transmission, comprising the steps of:

– generating an optical signal;

– modulating said optical signal with a periodic drive signal;

– modulating said optical signal with an information bearing signal at a preset frequency.

The invention method further comprises the step of generating said periodic drive signal by combining an amplified periodic signal at said preset frequency and at least an amplified periodic signal at a harmonic of said preset frequency.

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